Volunteer Lake Assessment Program Individual Lake Reports

SUNAPEE LAKE, SUNAPEE, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	28,863	**Max. Depth (m):**	31.9	**Flushing Rate (yr^{1})**	0.3
Surface Area (Ac.):	4090	**Mean Depth (m):**	11.4	**P Retention Coef:**	0.7
Shore Length (m):	47,600	**Volume (m^{3}):**	188,150,000	**Elevation (ft):**	1092

TROPHIC CLASSIFICATION

Year	Trophic class
1995	OLIGOTROPHIC
2006	OLIGOTROPHIC

KNOWN EXOTIC SPECIES

Variable Milfoil

The Waterbody Report Card tables are generated from the 2012 305(b) report on the status of N.H. waters, and are based on data collected from 2001-2011.

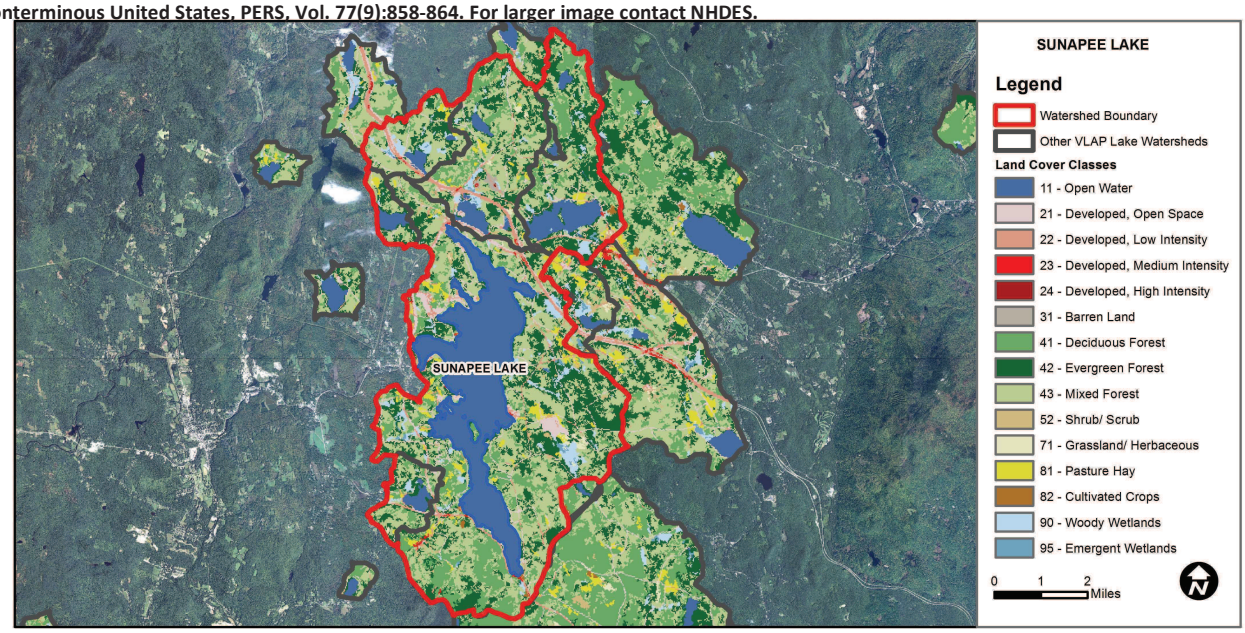
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	>/=5 samples and median is < threshold but > 1/2 threshold value.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	D.O. (mg/L)	Bad	>10%, with a minimum of 2, samples exceed criteria, with 1 or more by a large margin.
	D.O. (% sat)	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Chlorophyll-a	Very Good	>5 samples and median is < 1/2 threshold.
Primary Contact Recreation	E. coli	Very Good	All bacteria samples <75% of geometric mean criteria, but not enough to calculate geometric mean. Or, all bacteria samples are < single sample criteria and calculated Geometric means are less than geometric mean criteria.
	Chlorophyll-a	Very Good	At least 10 samples with 0 exceedances of criteria.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

SUNAPEE LAKE - DEPOT BEACH	E. coli	Cautionary	One exceedance of single sample criteria but not enough data to calcuate geometric mean. More data needed.
SUNAPEE LAKE - SUNAPEE STATE PARK BEACH	E. coli	Bad	>/=1 exceedance(s) of geometric mean criterion and/or >/=2 exceedances of single sample criterion, with 1 or more >2X criteria.
SUNAPEE LAKE - BLODGETT'S LANDING BEACH	E. coli	Bad	>/=1 exceedance(s) of geometric mean criterion and/or >/=2 exceedances of single sample criterion, with 1 or more >2X criteria.
SUNAPEE LAKE - DEWEY (TOWN) BEACH	E. coli	Bad	>/=1 exceedance(s) of geometric mean criterion and/or >/=2 exceedances of single sample criterion, with 1 or more >2X criteria.
SUNAPEE LAKE - GEORGES MILL TOWN BEACH	E. coli	Very Good	All bacteria samples <75% of geometric mean criteria, but not enough to calculate geometric mean. Or, all bacteria samples are < single sample criteria and calculated Geometric means are less than geometric mean criteria.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States. PERS, Vol. 77(9):858-864. For larger image contact NHDES.

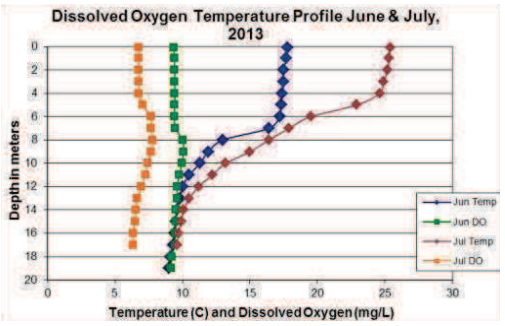


Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	17.9	Barren Land	0.18	Grassland/Herbaceous	0.44
Developed-Open Space	4.66	Deciduous Forest	12.49	Pasture Hay	2.59
Developed-Low Intensity	2.83	Evergreen Forest	21.94	Cultivated Crops	0.15
Developed-Medium Intensity	0.24	Mixed Forest	31.84	Woody Wetlands	3.2
Developed-High Intensity	0.01	Shrub-Scrub	1.14	Emergent Wetlands	0.3

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, STN 200, SUNAPEE, NH
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphics*)

- **CHLOROPHYLL-A:** Chlorophyll levels remained stable throughout the summer and were much less than the NH lake median. Historical trend analysis indicates stable chlorophyll levels with low variability between years.
- **CONDUCTIVITY/CHLORIDE:** Conductivity levels were slightly greater than the NH lake median; and while average epilimnetic conductivity has remained lower since 2006, historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity since monitoring began.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels remained relative stable throughout the summer but were slightly higher in June likely due to above average early summer rainfall. Average epilimnetic phosphorus decreased slightly from 2012 and was less than the state median; however historical trend analysis indicates significantly increasing (worsening) epilimnetic phosphorus level since 1993. Metalimnetic and hypolimnetic phosphorus levels were relatively stable and low throughout the summer.
- **TRANSPARENCY:** Transparency improved from June through August and then decreased slightly in September, and average transparency was much better than the NH lake median. Historical trend analysis indicates stable transparency with low variability between years.
- **TURBIDITY:** Deep spot turbidity was relatively low with small spikes in the Metalimnion in August and September likely due to algal growth.
- **PH:** pH tends to fluctuate below desirable range of 6.5 – 8.0 units. Historical trend analysis indicates stable epilimnetic pH with low variability between years.
- **RECOMMENDED ACTIONS:** The increasing epilimnetic phosphorus and conductivity trends are concerning. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff in the watershed. Work with watershed towns and residents to reduce stormwater runoff into tributaries and the lake. Conduct chloride monitoring to establish a baseline data set for the lake. Encourage local road agents and winter maintenance companies to obtain a NH Voluntary Salt Applicator license through the UNH Technology Transfer Center's Green SnowPro certification. Keep up the great work!



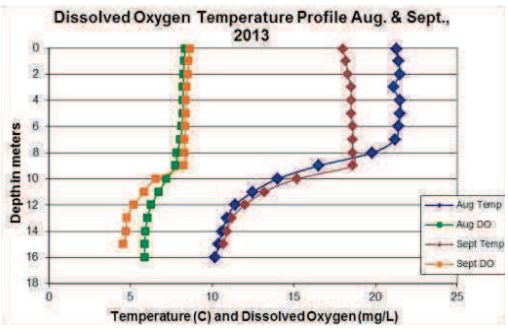
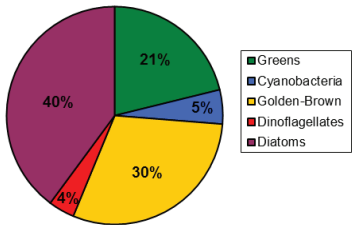


Table 1. 2013 Average Water Quality Data for SUNAPEE LAKE, STN 200

Station Name	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	Total P ug/l	Trans. m / VS	Turb. ntu	pH
Epilimnion	4.98	1.80	87.0	6	8.21	0.59	6.72
Hypolimnion			87.8	6		0.74	6.23
Metalimnion			88.3	6		0.82	6.35

Sunapee Lake 200 Phytoplankton Population

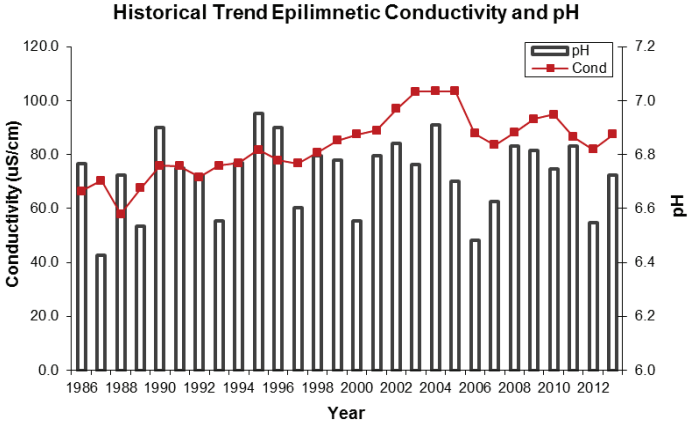


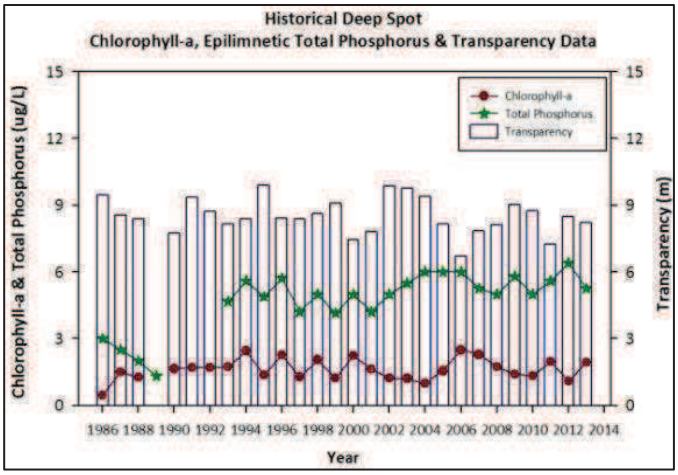
NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
pH	Stable	Trend not significant; data show low variability.	Chlorophyll-a	Stable	Trend not significant; data show low variability.
Conductivity	Degrading	Data significantly increasing.	Transparency	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Degrading	Data significantly increasing.

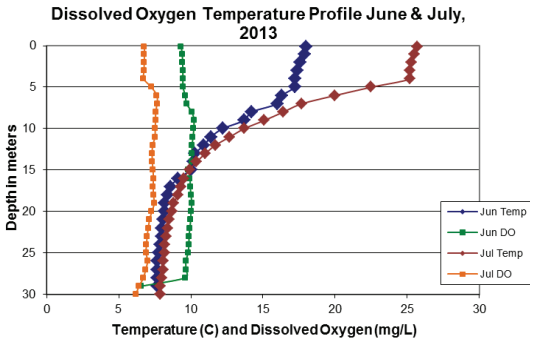


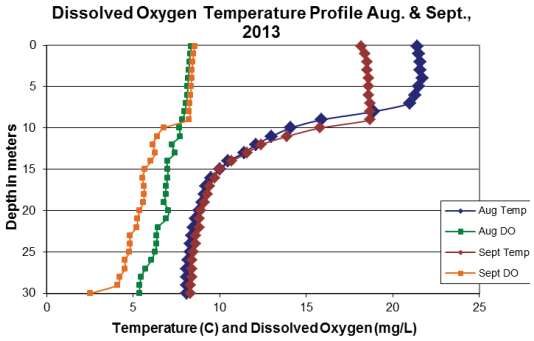


VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, STN 210, SUNAPEE, NH
2013 DATA SUMMARY

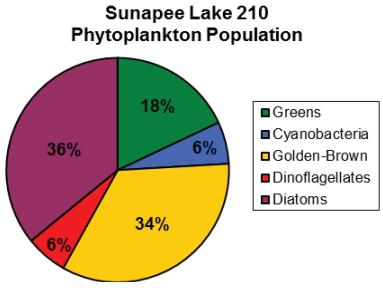
OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **CHLOROPHYLL-A:** Chlorophyll levels increased from June through September but remained low and were less than the NH lake median. Historical trend analysis indicates relatively stable chlorophyll with moderate variability between years.
- **CONDUCTIVITY/CHLORIDE:** Conductivity levels were slightly greater than the NH lake median and although average epilimnetic conductivity has remained slightly lower since 2006, historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels remained relatively stable throughout the summer but were slightly higher in June likely due to above average early summer rainfall. Average epilimnetic phosphorus increased slightly from 2012 and was less than the state median. Historical trend analysis indicates relatively stable epilimnetic phosphorus with moderate variability between years. Metalimnetic phosphorus levels were low but spiked in August likely due to algal growth, and hypolimnetic phosphorus levels remained low throughout the summer.
- **TRANSPARENCY:** Transparency was lower in June and July, improved in August, and decreased again in September. Above average rainfall may have contributed to decreased transparency. Average transparency was much better than the NH lake median and historical trend analysis indicates stable transparency with low variability between years.
- **TURBIDITY:** Epilimnetic turbidity was low throughout the summer. Metalimnetic turbidity was slightly elevated in July and August likely due to algal growth, and hypolimnetic turbidity was also slightly elevated in July and August.
- **PH:** pH tends to fluctuate below desirable range 6.5 – 8.0 units. Historical trend analysis indicates relatively stable epilimnetic pH with moderate variability between years.
- **RECOMMENDED ACTIONS:** Conduct chloride monitoring to establish a baseline data set for the lake. Encourage local road agents and winter maintenance companies to obtain a NH Voluntary Salt Applicator license through the UNH Technology Transfer Center's Green SnowPro certification. The increased frequency and intensity of storm events highlight the importance of managing stormwater runoff in the watershed. Keep up the great work!





Station Name	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	Total P ug/l	Trans. m / VS	Turb. ntu	pH
Table 1. 2013 Average Water Quality Data for SUNAPEE LAKE, STN 210							
Epilimnion	4.68	1.68	86.2	5	8.41	0.46	6.49
Hypolimnion			88.3	6		0.97	6.23
Metalimnion			87.4	6		1.16	6.41

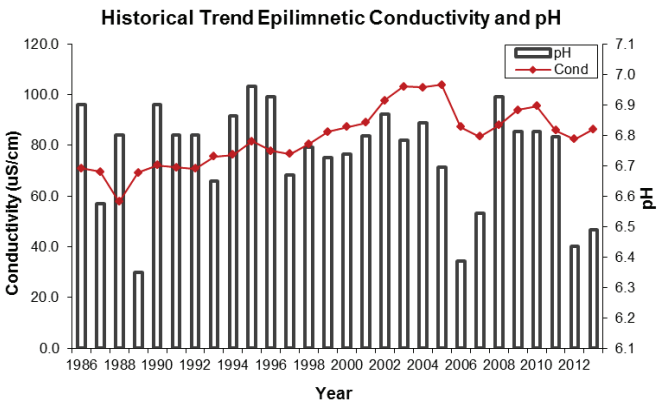


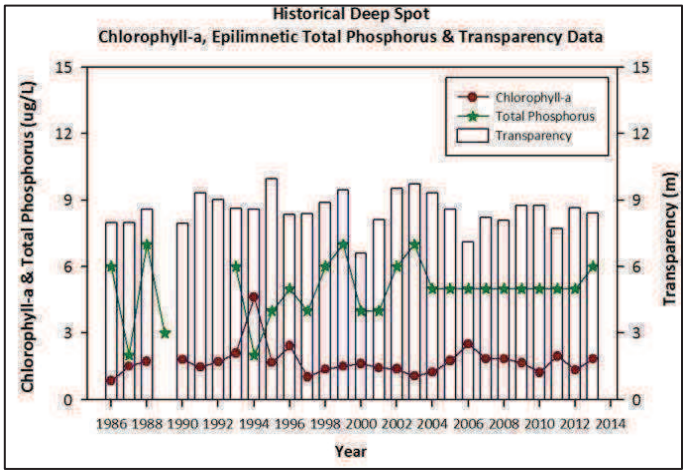
NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
pH	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
Conductivity	Degrading	Data significantly increasing.	Transparency	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.

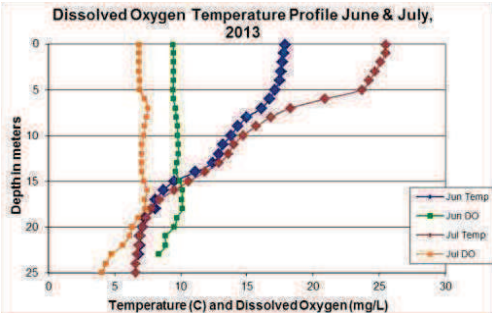




VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, STN 220, SUNAPEE, NH
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphics*)

- **CHLOROPHYLL-A:** Chlorophyll levels increased slightly as the summer progressed, increased slightly from 2012, and was much less than the NH lake median. Historical trend analysis indicates relatively stable chlorophyll with moderate variability between years.
- **CONDUCTIVITY/CHLORIDE:** Conductivity levels were slightly greater than the NH lake median likely due to winter maintenance activities in the watershed, however unlike other Sunapee deep spot stations, historical trend analysis indicates relatively stable conductivity with low variability between years.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels were stable and low throughout the summer, decreased slightly from 2012, and were much less than the NH lake median. Historical trend analysis indicates relatively stable epilimnetic phosphorus with moderate variability between years. Metalimnetic and hypolimnetic phosphorus levels were low throughout the summer.
- **TRANSPARENCY:** Transparency decreased slightly from June to July, improved in August, and then decreased again in September. Average transparency remained much better than the NH lake median. Historical trend analysis indicates stable transparency with low variability between years.
- **TURBIDITY:** Epilimnetic turbidity was slightly higher in June likely due to recent storm events and in August likely due to algal growth. Metalimnetic turbidity was slightly higher in August likely due to algal growth, and hypolimnetic turbidity was also elevated in August.
- **PH:** pH tends to fluctuate below desirable range 6.5 – 8.0 units. Historical trend analysis indicates relatively stable epilimnetic pH with moderate variability between years.
- **RECOMMENDED ACTIONS:** Conduct chloride monitoring to establish a baseline data set for the lake. The increased frequency and intensity of storm events highlight the importance of managing stormwater runoff in the watershed. Keep up the great work!



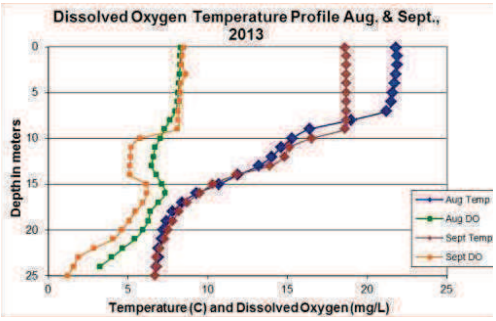
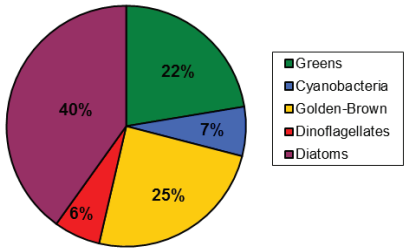


Table 1. 2013 Average Water Quality Data for SUNAPEE LAKE, STN 220

Station Name	Alk.	Chlor-a	Cond.	Total P	Trans.	Turb.	pH
	mg/l	ug/l	uS/cm	ug/l	m	ntu	
					VS		
Epilimnion	4.47	1.70	85.3	5	8.65	0.83	6.54
Hypolimnion			86.6	6		1.10	6.22
Metalimnion			86.2	6		0.87	6.34

Sunapee Lake 220 Phytoplankton Population

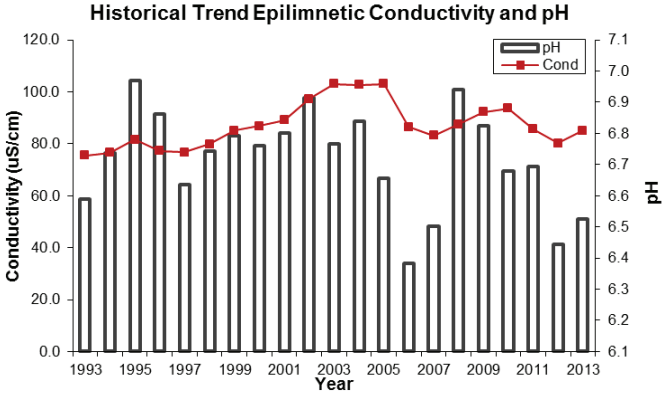


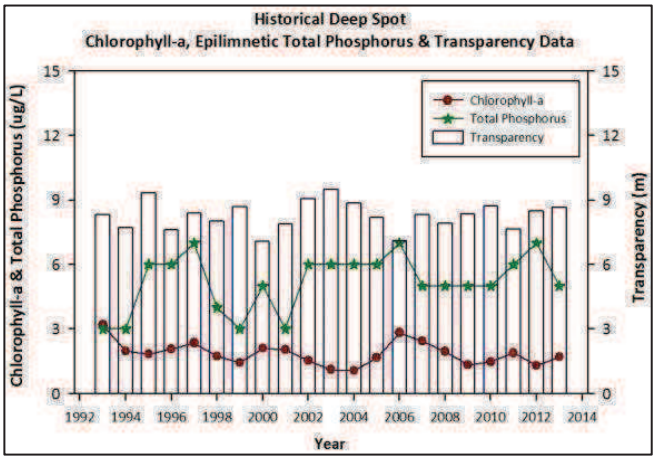
NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
pH	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
Conductivity	Stable	Trend not significant; data show low variability.	Transparency	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.

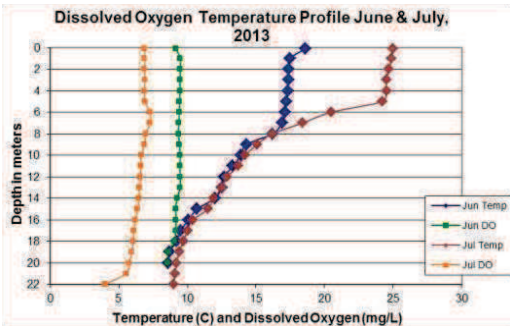




VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, STN 230, SUNAPEE, NH
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphics*)

- **CHLOROPHYLL-A:** Chlorophyll levels spiked in September however remained much less than the NH lake median. Historical trend analysis indicates stable chlorophyll levels with low variability between years.
- **CONDUCTIVITY/CHLORIDE:** Conductivity levels were slightly greater than the NH lake median; and while average epilimnetic conductivity has remained lower since 2006, historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity since monitoring began.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels remained relatively stable throughout the summer but were slightly higher in June likely due to above average early summer rainfall. Historical trend analysis indicates relatively stable epilimnetic phosphorus with moderate variability between years. Metalimnetic (middle water layer) and hypolimnetic (lower water layer) phosphorus levels were low throughout the summer.
- **TRANSPARENCY:** Transparency improved in August and September, was slightly better than 2012, and was much better than the NH lake median. Historical trend analysis indicates stable transparency with low variability between years.
- **TURBIDITY:** Epilimnetic turbidity was slightly higher in August likely due to algal growth. Metalimnetic turbidity was slightly higher in September likely due to algal growth, and hypolimnetic turbidity was slightly higher in July and September.
- **PH:** pH tends to fluctuate below desirable range 6.5 – 8.0 units. Historical trend analysis indicates relatively stable epilimnetic pH with moderate variability between years.
- **RECOMMENDED ACTIONS:** Epilimnetic phosphorus has remained at a slightly higher level since 2002. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff in the watershed. Work with watershed towns and residents to reduce stormwater runoff into tributaries and the lake. Conduct chloride monitoring to establish a baseline data set for the lake. Encourage local road agents and winter maintenance companies to obtain a NH Voluntary Salt Applicator license through the UNH Technology Transfer Center's Green SnosPro certification. Keep up the great work!



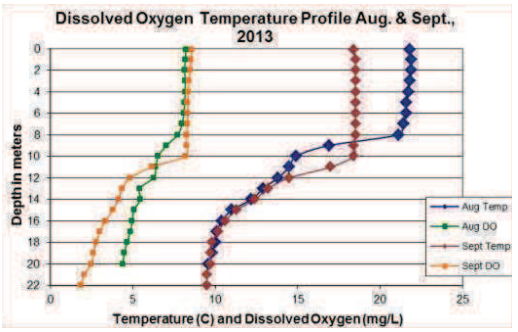
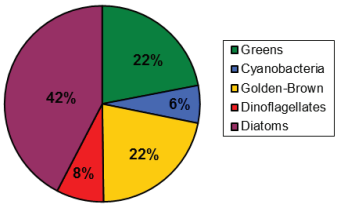


Table 1. 2013 Average Water Quality Data for SUNAPEE LAKE, STN 230

Station Name	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	Total P ug/l	Trans. m VS	Turb. ntu	pH
Epilimnion	4.70	1.90	84.6	6	8.75	0.60	6.52
Hypolimnion			85.4	7		0.82	6.23
Metalimnion			84.5	6		0.83	6.30

Sunapee Lake 230
Phytoplankton Population

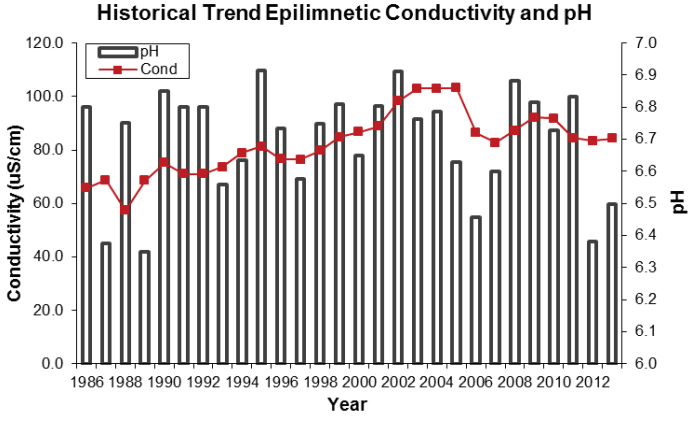


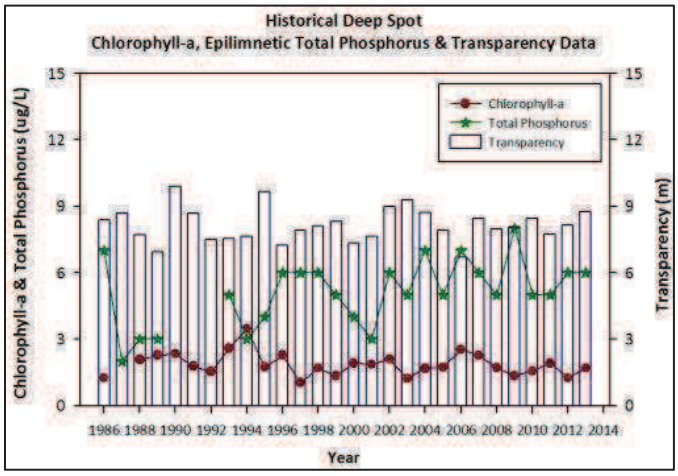
NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
pH	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data show low variability.
Conductivity	Degrading	Data significantly increasing.	Transparency	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.





VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, STNS 010, 020, 030, 070, 080, 090, 100.1, & 110
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphic)*

- **CHLOROPHYLL-A:** Chlorophyll levels were generally low and well below the NH lake median values at all stations. Chlorophyll levels were generally higher in June and July following significant early summer storm events and likely nutrient loading to the lake. The 2013 average chlorophyll levels increased at all stations from those measured in 2012. Historical trend analysis indicates relatively stable chlorophyll with moderate variability between years at all stations.
- **CONDUCTIVITY/CHLORIDE:** Conductivity at all stations was slightly greater than the NH lake median. Historical trend analysis indicates conductivity has significantly increased (worsened) since monitoring began at Stations 010, 020, 030, 070, 080, 090, and 110, and has remained stable with low variability between years at Station 100.1.
- **TOTAL PHOSPHORUS:** Average phosphorus levels at Stations 010, 020, 080, 090, and 110 were low and less than the NH lake median. Average phosphorus levels at Stations 030, 070 and 100.1 were slightly elevated and greater than the NH lake median. Specifically, June phosphorus levels were elevated at Stations 020, 030, 080, and 090 likely due to stormwater runoff from significant storm events prior to sampling. July phosphorus levels were elevated at Stations 030, 100.1 and 110. August phosphorus levels were elevated at Stations 030 and 070 following significant storm events. September phosphorus levels were elevated at Station 100.1. Several stations noted abundant Gloeotrichia in September. Historical trend analysis indicates highly variable phosphorus levels at Stations 010, 020 and 100.1. Historical trend analysis indicates significantly increasing (worsening) phosphorus at Stations 030, 070, 080, 090, and 110, and in particular phosphorus levels have been much greater at these stations since 2005.
- **TRANSPARENCY:** In general, average transparency decreased slightly from 2012 at Stations 010, 030, 080, 100.1, and 110, and improved or remained stable at stations 020, 070 and 090. The Secchi disk was visible on the lake bottom at Stations 020, 070, 080, 090, and 100.1 on at least one sampling event. Historical trend analysis indicates relatively stable transparency with moderate variability at Stations 010 and 080, and stable transparency with low variability at Stations 020, 030, 070, 090, and 100.1. Historical trend analysis indicates significantly decreasing (worsening) transparency at Station 110.
- **TURBIDITY:** Turbidity was generally elevated in June following significant storm events, and in September during Gloeotrichia growth. Average 2013 turbidity decreased at Stations 020, 030, 070, 080, 100.1, and 110 from 2012 levels, but did not result in improved transparency which may have been affected by other factors such as wind, wave action and cloud cover.
- **PH:** pH fluctuates below desirable range 6.5 – 8.0 units at most stations.
- **RECOMMENDED ACTIONS:** Evaluate potential causes of the significantly increasing phosphorus levels, particularly since 2005. Potential causes could be an increase in significant storm events, increased stormwater velocity and flow through culverts and tributaries, lake drawdown and subsequent re-fill, road construction, and watershed development. Conduct chloride monitoring at all stations to establish a baseline data set as road salting is likely one factor contributing to the significantly increasing near shore conductivity.

Table 1. 2013 Average Water Quality Data for NEARSHORE STNS

Station Name	Chlor-a ug/l	Cond. uS/cm	Total P ug/l	Trans. m	Turb. ntu	pH
				VS		
10	1.97	91.7	7	7.65	0.88	6.69
20	1.45	84.4	10	4.30	0.95	6.57
30	2.24	86.7	13	8.25	0.91	6.58
70	1.34	83.2	15	6.40	1.14	6.58
80	1.53	83.1	10	1.75	2.77	6.48
90	1.62	82.0	10	7.05	1.35	6.58
100.1	1.50	92.4	31	7.23	1.11	6.65
110	1.72	89.5	8	6.13	1.07	6.60

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Station	Parameter	Trend	Explanation
010	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show moderate variability.
	Phosphorus	Stable	Data show high variability.
	Conductivity	***Degrading***	***Data significantly increasing***
020	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show low variability.
	Phosphorus	Stable	Data show high variability.
	Conductivity	***Degrading***	***Data significantly increasing***
030	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show low variability.
	Phosphorus	***Degrading***	***Data significantly increasing.***
	Conductivity	***Degrading***	***Data significantly increasing.***
070	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show low variability.
	Phosphorus	***Degrading***	***Data significantly increasing.***
	Conductivity	***Degrading***	***Data significantly increasing.***

Station	Parameter	Trend	Explanation
080	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show moderate variability.
	Phosphorus	***Degrading***	***Data significantly increasing.***
	Conductivity	***Degrading***	***Data significantly increasing.***
090	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show low variability.
	Phosphorus	***Degrading***	***Data significantly increasing.***
	Conductivity	***Degrading***	***Data significantly increasing.***
100.1	Chlorophyll-a	Stable	Data show moderate variability.
	Transparency	Stable	Data show low variability.
	Phosphorus	Stable	Data show high variability.
	Conductivity	Stable	Data show low variability.
110	Chlorophyll-a	Stable	Data fluctuate annually.
	Transparency	***Degrading***	***Data significantly decreasing.***
	Phosphorus	***Degrading***	***Data significantly increasing.***
	Conductivity	***Degrading***	***Data significantly increasing.***

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, BLODGETT BROOK SUB-WATERSHED
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS BLODGETT BROOK SUB-WATERSHED (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity from Stn. 1115 (Chalk Pond Outlet) to Stn. 790 (N. Branch) does not change significantly from upstream to downstream stations and is approximately equal to the NH lake median. However, Stn. 788 (S. Branch) conductivity was slightly elevated on each sampling event, and conductivity was higher during low flow conditions.
- **TOTAL PHOSPHORUS:** Overall, 2013 phosphorus levels were low at Stn. 1115, average at stations 790, 790.2 and 790.4, and above average at Stn. 788. Phosphorus was slightly elevated at Stn. 788 in June due to organic surface debris that contaminated the sample and early September following a significant rain event, and was extremely elevated in July following several inches of rainfall. Phosphorus was slightly elevated in at Stn. 790 in early September following several inches of rainfall.
- **TURBIDITY:** Turbidity levels were elevated at Stns. 788 and 790 in July and early September following significant rain events. Turbidity was elevated at Stns. 1115 and 790.4 in May during dry conditions and in June following a significant rain event. Turbidity was generally low at Stn. 790.2.
- **PH:** pH levels generally lower at Stns. 1115 and 790.4 and tend to fluctuate below desirable levels at all stations.
- **RECOMMENDED ACTIONS:** Turbidity and phosphorus levels were elevated at Stns. 788, 790, 790.4 and 1115 following significant storm events indicating stormwater erosion in the sub-watershed. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff from lake and watershed properties, dirt/gravel roads, and steep slopes. Educate watershed residents on ways to reduce stormwater runoff from their properties. Conduct chloride monitoring to establish a baseline data set for the tributary. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Blodgett Bk. Sub-Watershed

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Blodgett Brook (S. Branch)	788	102.7	34	2.09	6.38
Blodgett Brook (N. Branch)	790	46.3	17	1.40	6.42
Blodgett Brook	790.2	38.7	16	0.87	6.31
Blodgett Brook (S. County Rd.)	790.4	32.7	17	1.09	6.04
Chalk Pond Outlet	1115	41.3	7	1.74	6.24

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, CHANDLER BROOK AND JOHNSON BROOK SUB-WATERSHEDS
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS CHANDLER BROOK AND JOHNSON BROOK SUB-WATERSHEDS (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity was slightly elevated and greater than the NH lake median at all Stns., particularly at Stns. 670 and 670.5. Conductivity increased greatly during low flow conditions at Stns. 670, 675 and 680.
- **TOTAL PHOSPHORUS:** Phosphorus levels were low at Stns. 675 and 680 on each sampling event. Phosphorus levels were within an average range at Stns. 670 and 670.5, but were slightly elevated at Stn. 670.5 in July and October when turbidity levels were also elevated.
- **TURBIDITY:** Turbidity levels at Stn. 670 were elevated on each sampling event and increased as tributary flow decreased. Turbidity levels at Stn. 670.5 were slightly elevated in May, June and September, and elevated in July and October. A low amount of sediment was generally noted in all samples, and it was noted in May that the beaver activity upstream of this site appears to be gone. Turbidity was generally low at Stn. 675 on each event. Turbidity was slightly elevated at Stn. 680 on each sampling event and low flows and sediment were the likely causes.
- **PH:** pH levels fluctuated below desirable range 6.5 – 8.0 units at all stations except Stn. 680.
- **RECOMMENDED ACTIONS:** Tributary samples were generally collected during dry conditions without prior significant rain events. The 2012 water quality results indicated potential stormwater erosion and impacts in the sub-watersheds. Conduct storm event sampling to better evaluate the impacts of stormwater runoff. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff from lake and watershed properties, roadways, steep slopes, and agricultural lands. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Chandler & Johnson Brooks

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Chandler Brook	670	119.4	14	2.75	6.37
Chandler Brook	670.5	108.8	14	1.67	6.42
Chandler Brook (Beck Brook)	680	71.2	7	0.77	6.41
Johnson Brook	675	92.4	8	1.48	6.79

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, HERRICK COVE SUB-WATERSHED
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS HERRICK COVE SUB-WATERSHED (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity at all stations was elevated and much greater than the NH lake median. Conductivity was generally lower when stream flows were higher. Conductivity at Stn. 835 was much higher throughout the season. This station receives stormwater runoff from many area roadways that could be influencing the conductivity levels.
- **TOTAL PHOSPHORUS:** In general, phosphorus levels were low at Stn. 835 and elevated at Stns. 830, 830.15 and 830.2. Phosphorus levels at Stn. 830 were elevated from July through September, and turbidity was also elevated. Significant storm events in July and September, and low flow in August likely contributed to elevated phosphorus. Phosphorus levels have significantly increased (worsened) at this station since monitoring began, and particularly phosphorus levels have been greater since 2005. Phosphorus levels at Stns. 830.15 and 830.2 were elevated in July and turbidity was also elevated, stream flow and murky water was noted.
- **TURBIDITY:** Turbidity levels at Stn. 830 were elevated in July, August and September. Significantly storm events in July and September and low flow in August contributed to turbidity. Turbidity levels at Stns. 830.15 and 830.2 were elevated in July and August during low flow conditions and samples were noted to have a yellow color in August. Turbidity was low at Stn. 835.
- **PH:** pH levels were below desirable range 6.5 – 8.0 units at Stns. 830, 830.15 and 830.2 and were generally within desirable range at Stn. 835.
- **RECOMMENDED ACTIONS:** Phosphorus has significantly increased at Stn. 830 since monitoring began, and has remained particularly high since 2005. Turbidity has also been greater at this station since 2001. Investigate potential sources of increased phosphorus and turbidity such as stormwater runoff and culvert discharge from Interstate 89, and agricultural activities. Debris is often noted in the tributary; consider obtaining a Wetlands permit to remove debris from the tributary if deemed necessary to return the site to a more natural state. Shoreline and beach erosion were noted at Stn. 835 however turbidity levels are often very low. Phosphorus and turbidity levels were generally elevated at Stns. 830, 830.15 and 830.2 following significant storm events indicating stormwater erosion in the sub-watershed. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff, particularly from major highways and paved roadways, and to ensure culverts are sized properly for larger storm events. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Herrick Cove Sub-Watershed

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Herrick Cove South	830	368.8	32	4.43	6.09
Herrick Cove South	830.15	331.7	36	6.69	6.16
Herrick Cove South	830.2	302.7	42	6.64	6.21
Herrick Cove North	835	711.8	10	0.73	6.61

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, LITTLE LAKE SUNAPEE SUB-WATERSHED
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS LITTLE LAKE SUNAPEE SUB-WATERSHED (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity is elevated and much greater than the NH lake median at Stns. 1415 and 1418. These stations receive runoff from various roadways and a salt storage facility. Management efforts are currently underway to reduce conductivity at these stations. Conductivity at Stn. 1410.5 was low and less than the NH lake median, and conductivity at Stn. 1420 was slightly greater than the NH lake median.
- **TOTAL PHOSPHORUS:** Phosphorus levels at Stn. 1420 were low throughout the summer. Phosphorus levels at Stn. 1410.5 were average throughout the summer. Phosphorus levels at Stn. 1415 were slightly above average in July, August and September following significant rain events. Phosphorus levels at Stn. 1418 were above average and elevated in September following significant rain event and October during low flow.
- **TURBIDITY:** Turbidity levels at Stn. 1410.5 were slightly elevated in September following a significant rain event and a small amount of sediment was noted in the sample. Turbidity levels at Stn. 1415 were elevated throughout the summer. Low flow conditions were noted in May and October, and significant rain events and moderate flow was noted in June, July and September. August flow was moderate and field data note yellow water and particulate matter floating in the tributary. Turbidity levels at Stn. 1418 were elevated throughout the summer. Dry conditions and low flows were noted in May, August and October, and significant rain events and high flows occurred in June, July and September. Water color was often noted as brown with low to high amounts of sediment/organic matter in the samples. Turbidity levels at Stn. 1420 were low throughout the summer.
- **PH:** pH levels were generally lower at Stn. 1418 and tend to fluctuate below desirable range 6.5 – 8.0 units at all stations.
- **RECOMMENDED ACTIONS:** Turbidity and/or phosphorus were elevated after significant rain events at Stations 1415 and 1418 indicating potential stormwater erosion in those sub-watersheds. Shoulder erosion of a State roadway was noted at Stn. 1415 and likely contributed to the elevated turbidity and phosphorus. Contact the Dept. of Transportation to inquire about fixing the shoulder erosion. Water color was often noted as brown and in August water color was noted as yellow indicating potential influences from wetland areas and/or streams with high organic content and leaching of tannic and humic acids. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Little Lake Sunapee Sub-Watershed

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Kidder Brook Upstream	1410.5	19.0	12	0.98	6.38
Bucklin Beach Brook	1415	460.3	17	4.12	6.61
Murray Pond Outlet	1418	294.3	31	3.04	5.99
Little Lake Sunapee Outlet	1420	80.3	7	0.63	6.28

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, NEWBURY INLET, CUNNINGHAM & BARTLETT BROOKS
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS NEWBURY INLET, CUNNINGHAM & BARTLETT BROOKS (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity was slightly greater than the NH lake median at Stn. 720.1 on each sampling event, particularly in May during dry conditions. Conductivity at Stns. 750 and 760 was relatively low and approximately equal to or below the NH lake median.
- **TOTAL PHOSPHORUS:** Phosphorus levels were slightly above average at Stn. 720.1 and unusually low flow conditions may have contributed to the higher phosphorus. Phosphorus levels at Stn. 750 were slightly elevated on the October sampling event during low flow and small amount of sediment was noted in the sample. Phosphorus levels at Stn. 760 were elevated in September following significant rain event.
- **TURBIDITY:** Turbidity levels at Stn. 720.1 were slightly elevated in May and June likely due to low flow conditions. Turbidity levels at Stn. 750 were relatively low throughout the summer. Turbidity levels at Stn. 760 were slightly elevated in September following significant storm event and October during low flow and sediment/organic matter was noted in the sample.
- **PH:** pH levels tend to fluctuate below desirable range 6.5 – 8.0 units at all stations.
- **RECOMMENDED ACTIONS:** Phosphorus and turbidity were elevated at Stn. 760 following significant rain event in September. Shoulder erosion was noted at Stn. 750 again this year, and at Stn. 760 shoulder erosion was noted on the field data sheet in 2012. It was noted that both roadways were state roads. Contact the NH Department of Transportation to stabilize the eroded areas and prevent further erosion and sedimentation to the lake. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Newbury Inlet, Cunningham & Bartlett Brooks

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Newbury Inlet	720.1	77.1	15	1.51	5.75
Cunningham Brook	750	51.6	8	0.58	6.39
Bartlett Brook	760	24.4	18	0.95	6.35

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, OTTER POND, LEDGE POND, EAGLE ROCK BROOKS, JOBS CREEK & OUTLET SUB-WATERSHEDS
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS OTTER POND, LEDGE POND, EAGLE ROCK BROOKS & JOBS CREEK SUB-WATERSHEDS (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity was slightly elevated and greater than the NH lake median at Stns. 505, 510 and 610. Conductivity was elevated and much greater than the NH lake median at Stn. 515.1. Iron deposits were noted at Stn. 510 which likely contributed to the elevated conductivity. Conductivity at Stn. 540 was low on each sampling event.
- **TOTAL PHOSPHORUS:** Phosphorus levels at Stns. 505, 510 and 610 were low throughout the summer. Phosphorus levels at Stn. 515.1 were slightly elevated in May due to low flow conditions and the turbidity was also elevated. Phosphorus levels at Stn. 540 were slightly elevated in July and September following significant storm events and potential flushing of wetland systems.
- **TURBIDITY:** Turbidity levels were generally low at Stns. 505, 510, 540, and 610. Turbidity levels were elevated at Stn. 515.1 in May likely due to low flow conditions and lab data note sediment in the sample.
- **PH:** pH levels were generally lower at Stn. 540 likely due to wetland influences. pH levels at all stations fluctuate below desirable range 6.5 – 8.0 units.
- **RECOMMENDED ACTIONS:** Conductivity continues to be elevated at Stn. 515.1 Eagle Rock Brook. Conduct chloride monitoring to establish a baseline data set and determine the relative impact of road salting in the area. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff from lake and watershed properties, roadways, steep slopes, and agricultural lands. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Otter Pond, Ledge Pond, Eagle Rock Brooks, Jobs Creek, & Outlet

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Otter Pond Brook	505	132.2	8	0.67	6.52
Ledge Pond/Muzzey Brook	510	118.9	8	0.77	6.49
Eagle Rock Brook	515.1	469.6	8	2.22	6.48
Jobs Creek	540	28.5	15	0.89	5.88
Outlet	610	85.6	7	0.65	6.41

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
LAKE SUNAPEE, PIKE BROOK SUB-WATERSHED
2013 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS PIKE BROOK SUB-WATERSHED (*Refer to Table 1)*

- **CONDUCTIVITY/CHLORIDE:** Conductivity levels were slightly greater than the state median at all stations, however Stn. 805 conductivity levels were higher than the others. Conductivity levels increased slightly at all stations as the summer progressed and water level and flow conditions were lower.
- **TOTAL PHOSPHORUS:** Overall, 2013 phosphorus levels were low at Stn. 800.8 and within an average range at all other stations. Phosphorus levels were slightly elevated at Stns. 800 and 805 in June and July after rain events.
- **TURBIDITY:** Turbidity levels were elevated at Stn. 800 and 800.8 in June following a significant rain event, and at Stn. 800 in late September during low flow. Turbidity levels at Stn. 805 were slightly elevated in June and July following rain events and in August during low flow.
- **PH:** pH levels were generally lower at all stations during higher flow and following rain events. pH levels at all stations tend to fluctuate below desirable range of 6.5 – 8.0 units.
- **RECOMMENDED ACTIONS:** Turbidity and phosphorus generally increased from the upstream Stn. 800.8 to the downstream Stn. 800. Water color at Stn. 800 and 805, the downstream stations, were often noted as tea colored following rain events indicating flushing of wetland or other systems high in tannic, humic and fulvic acids which could affect pH levels, phosphorus and turbidity. Keep up the great work!

Table 1. 2013 Average Water Quality Data for Pike Brook Sub-Watershed

Sub-Watershed Name	Station Name	Cond. uS/cm	Total P ug/l	Turb. ntu	pH
Pike Brook	800	57.8	16	1.18	6.34
Pike Brook	800.5	49.2	12	0.79	6.37
Pike Brook	800.8	44.2	10	0.84	6.43
King Hill Brook	805	74.9	17	1.02	6.44

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)